

the Observatory photoheliograph, both the photographs which he took of the corona during totality and the above photographs of the partial phase. The former I myself brought home to the Royal Observatory, Greenwich; the latter will be sent at the first available opportunity.

I took no observations myself of temperature during the eclipse, the Director of the Royal Alfred Observatory having made arrangements for full meteorological observations being taken both at the Observatory and at several other stations, not only in Mauritius, but also on other islands in the Indian Ocean.

“Preliminary Note on Observations of the Total Solar Eclipse of 1901 May 18, made at Pamplémousses, Mauritius.” By (Mrs.) A. S. D. MAUNDER. Received October 23,—Read at Joint Meeting of the Royal and Royal Astronomical Societies, October 31, 1901.

Having observed successfully the eclipses of 1898 January 22, in India, and 1900 May 28, in Algiers, and my husband having been sent to Mauritius as the representative of the Royal Observatory, Greenwich, to observe the eclipse of May 18 last, I determined to accompany him, and to take with me the instruments which we had used in 1900. By the great kindness of Mr. G. J. Newbegin, F.R.A.S., I was also furnished with a $4\frac{1}{4}$ -inch Cooke photo-visual telescope of 71 inches focus.

As my husband fixed his observing station at the Royal Alfred Observatory, Pamplémousses, and as the Director, Mr. Claxton, gave me every facility, I set up my instruments in the Observatory grounds. The Newbegin telescope was mounted upon the equatorial stand of the photoheliograph which was left vacant, the Mauritius photoheliograph having been dismantled in order that it might be used in connection with the 16-inch cœlostæt of the official Greenwich Expedition. The photoheliograph dome stands on the east of the Observatory grounds, and about 150 feet to the west of the dome I set up the Waters equatorial lent to my husband by the Royal Astronomical Society, which I used to carry two little cameras, each with a $1\frac{1}{2}$ -inch Dallmeyer Stigmatic lens. About 105 feet further west the camera belonging to the Waters telescope was firmly fixed, pointing directly to the Sun, and by its side the Niblett lens belonging to the British Astronomical Association, a photographic lens 4 inches in diameter, and of 34 inches focus. This was likewise fixed rigidly. Mr. Nevil Maskelyne, F.R.A.S., also lent me his kinematograph, and this was mounted a few feet further south. The management of these instruments during the eclipse was very kindly undertaken by several friends, and I was

further helped by three non-commissioned officers who had volunteered to assist in the eclipse observations. The entire party was arranged as follows:—

Personnel.

Mr. A. Walter : Newbegin photo-visual telescope, 71 inches focus.

Bombadier A. H. Thorne : Recorder to Mr. Walter.

Mrs. Walter Maunder : Dallmeyer Stigmatic lens twin camera, 9 inches focus.

Sergeant J. H. Tyson : Recorder to Mrs. Maunder.

Lance-Corporal A. Bagné : Waters camera, 8 feet equivalent focus.

Mr. G. H. Ireland : Kinematograph. The kinematograph gave no result, the film tearing across before totality was reached.

(Mr. Ireland brought a camera of about 2 feet focus, which was mounted as a stationary camera, and six exposures were made with it by Mr. T. W. Hanning.)

I add here a brief description of the photographs obtained :

1. *The Dallmeyer Stigmatic Twin Camera.*

These lenses are each $1\frac{1}{2}$ inches aperture, 9 inches focus, and give a field nearly 40° in diameter on a plate 16 cm. square. I procured one of these lenses in 1897, on account of its great field, in order to photograph the Milky Way, and it being the only photographic lens I then possessed, I took it to India in 1898. Exposures of 20 seconds made with it upon the corona of that year, recorded the coronal extensions much further from the Sun than they had been photographed before; in one instance to a distance of 13.9 lunar radii from the Sun's centre. My purpose on this occasion was to repeat the Indian exposures of 20 seconds, and also to try the effect of exposures longer still. I therefore gave two exposures with each camera—one of 2 minutes and one of 20 seconds.

No. 1.—From 30 seconds to 150 seconds. Exposure 120 seconds.
Sandell Triple-coated plate.

A fairly dense negative. The chromosphere has come up as a very brilliant ring, but the motion of the Moon across the Sun's disc during the very considerable exposure is very apparent. Of course no detail of the inner corona is seen on such a small image, except the large prominence on the east limb of the Sun, but the outer corona is fairly defined, tapering in long rod-like rays which on the east side of the corona reach a distance from the Sun of about five lunar radii, and on the west side of about six.

No. 2.—From 30 seconds to 150 seconds. Exposure 120 seconds.
Imperial Special Rapid plate.

This negative is not so dense nor so well defined as No. 1. The

sky glare has come up, and the extensions are not so considerable as in the former case.

No. 3.—From 170 seconds to 190 seconds. Exposure 20 seconds.
Sandell Triple-coated plate.

The image of the corona is fairly dense, but the sky glare has not come up so much as in the previous cases, and it shows as great extension as No. 1.

No. 4.—From 170 seconds to 190 seconds. Exposure 20 seconds.
Imperial Special Rapid plate.

This is a weak image, and has no points to recommend it.

(Nos. 3 and 4 have a double image on them, due probably to the cameras not having settled down after the plate-carriers were changed.)

2. The Niblett Lens.

This lens is of 4 inches aperture and 34 inches focus, fitted with a revolving drum carrying 5-inch by 4-inch plates.

No. 1.—Exposed at second contact. Exposure about $\frac{1}{4}$ second.
Imperial Fine Grain plate.

This photograph was taken at second contact, and several "beads" of sunlight are seen. Nevertheless, not only is there a great deal of detail to be seen in the middle corona, but on the west side a coronal ray can be traced to two lunar radii, and on the east side to a somewhat greater distance. The image is a fairly dense one. The image is not large enough, nor was the exposure sufficiently short to show any detail in the prominences or chromosphere, but the polar rays and the "combing out" of the equatorial wings are well seen.

No. 2.—Exposed at 40 seconds. Exposure about $\frac{1}{4}$ second. Imperial Ordinary plate.

A fairly dense image, showing the polar rays and middle corona well.

No. 3.—Exposed at 80 seconds. Exposure about $\frac{1}{4}$ second. Imperial Special Rapid plate.

The image is not so dense as in the previous cases, but the coronal rays can be traced to a greater distance, as can also the polar rays.

No. 4.—Exposed at 120 seconds. Exposure about $\frac{1}{4}$ second.
Imperial Special Rapid plate.

A weak faint image, under-developed. No detail shown.

No. 5.—Exposed at 160 seconds. Exposure about $\frac{1}{4}$ second.
Imperial Ordinary plate.

Under developed, only the chromospheric ring seen.

No. 6.—Exposed at 200 seconds. Exposure about $\frac{1}{4}$ second.
Imperial Fine Grain plate.

A good image, not very dense, showing the middle corona and polar rays well.

3. *The Newbegin Telescope.*

This lens is a Cooke photo-visual objective of $4\frac{1}{4}$ inches aperture and 71 inches focus. The photographs were taken on quarter plates. They form an exceedingly fine series of fourteen, taken on different makes of plate and with differing exposures. They bear magnification well up to the limit we have yet tried, namely, to one giving 4 inches to the Sun's diameter. Every photograph in this series was successful.

No. 1.—Exposed 7 seconds after commencement of totality.
Exposure instantaneous. Plate, Lumière Orthochromatic,
Series A.

This is a not very dense negative, and shows the prominences on the east side of the Sun, and the very complicated structure of the corona surrounding them. From the large prominence on the Sun's east equatorial limb two very marked and irregular black rifts or streaks cross the coronal wing and seem to broaden as they get further away from the Sun. A similar single streak leaves the Sun's surface to the south of the large prominence in the south-east.

No. 2.—Exposed at 21 seconds after commencement of totality.
Exposure, 2 seconds. Plate, Imperial Fine Grain Ordinary.

A denser negative than No. 1, showing great extension of the polar rays. In the northern polar rays is seen a forked dark marking cutting the rays obliquely.

No. 3.—Exposed at 32 seconds after the commencement of totality.
Exposure 4 seconds. Plate, Imperial Fine Grain Ordinary.

The dark marking in the north polar rays is clearly seen. There is a greater extension on the north-western side of the corona than in the two previous photographs.

No. 4.—Exposed at 45 seconds after commencement of totality.
Exposure 6 seconds. Plate, Imperial Fine Grain Ordinary.

The corona is distinctly larger than on the previous photographs, and the dark marking cutting the north polar rays is very clearly seen.

No. 5.—Exposed 1 minute after commencement of totality. Exposure 8 seconds. Plate, Imperial Fine Grain Ordinary.

A negative very similar to No. 4.

No. 6.—Exposed at 77 seconds after commencement of totality. Exposure 10 seconds. Plate, Imperial Fine Grain Ordinary.

No. 7.—Exposed at 94 seconds after totality. Exposure 6 seconds. Plate, Imperial Ordinary.

This negative is perhaps not so well defined as the others.

No. 8.—Exposed at 107 seconds after totality. Exposure 6 seconds. Plate, Imperial Ordinary.

This negative is not very dense, but the corona is very large, and it shows a greater extension of the coronal rays than any of the previous ones.

No. 9.—Exposed at 126 seconds after totality. Exposure 10 seconds. Plate, Imperial Fine Grain Ordinary.

No. 10.—Exposed at 144 seconds after totality. Exposure 8 seconds. Plate, Imperial Fine Grain Ordinary.

No. 11.—Exposed at 162 seconds after totality. Exposure 6 seconds. Plate, Imperial Fine Grain Ordinary.

On this negative it is very clearly seen that the bulbous curves at the base of the great north-east wing are laid over and across other coronal curves in the background.

No. 12.—Exposed at 176 seconds after totality. Exposure 4 seconds. Plate, Imperial Fine Grain Ordinary.

This photograph shows perhaps best the corona in the south-west region. Here there seem to be a number of synclinal groups, which give the impression of not being all in the plane of the photograph, as usually appears to be the case in coronal negatives, but in different planes.

No. 13.—Exposed at 191 seconds after totality. Exposure 2 seconds. Plate, Imperial Fine Grain Ordinary.

The corona is here very restricted. In the south-west region the exposure does not seem to have been sufficient to bring up all the synclinal groups, and in consequence the south polar rays have the appearance of encroaching on this side.

No. 14.—Exposed at 202 seconds after the commencement of totality. Exposure instantaneous. Plate, Lumière Orthochromatic, Series A.

This negative is fainter than any of the others, but shows well the detail and prominence in the south-west region of the corona.

4. *The Waters Camera.*

This is a Dallmeyer portrait combination of 2 inches aperture, and 8 feet equivalent focus, a Dallmeyer telephoto lens being used as a negative enlarger. The photographs were taken on half plates. The enlargement is rather too great for detail of any importance to be shown, and there is therefore no need to describe them in detail. Exposures of about a quarter of a second were given in all cases.

- No. 1.—Exposed at second contact. Plate, Imperial Special Rapid.
- No. 2.—Exposed at 40 seconds. Plate, Imperial Special Rapid.
- No. 3.—Exposed at 80 seconds. Plate, Imperial Flashlight.
- No. 4.—Exposed at 120 seconds. Plate, Imperial Flashlight.
- No. 5.—Exposed at 160 seconds. Plate, Imperial Flashlight.
- No. 6.—Exposed at 200 seconds. Plate, Imperial Special Rapid.

5. *The Pinhole Camera.*

This was a camera with pinhole aperture of $\frac{1}{82}$ of an inch, and the plate was placed at a distance of 30 inches. The plate was exposed immediately before second contact, and closed immediately after third. A small arc of sunlight is thus seen both on the east and west limbs of the Moon. A coronal ring, about 4 minutes in greatest height, is seen connecting these arcs. The little photograph has of course no scientific value, but as being the only instance of a photograph of the corona taken with a pinhole, it may rank as a curiosity. The ratio of aperture to focal length was as 1 to 960, and the exposure given to the plate would correspond to one of $\frac{1}{15}$ th of a second, as given with the Newbegin. The plate used was an Imperial Special Rapid.

6. *Photographs of the Landscape.*

At my request M. Alexander Rambert, a professional photographer of Mauritius, took a series of photographs of the landscape during the coming on and passing off of the shadow. The same exposure was given in every instance, the plates were all from the same batch, and they were developed at one and the same time, in the same bath and for the same length of time. The exposures were made at regular intervals of 5 minutes, the first being taken $27\frac{1}{2}$ minutes before mid-totality, the last $27\frac{1}{2}$ minutes after. A comparison of the plates taken before totality with those taken at corresponding times after, shows a slight but appreciable increase in density in the later plates as compared with the earlier, but perhaps not more than would be accounted for by the increase in altitude of the Sun.
